Zeitschrift: L'Enseignement Mathématique
Herausgeber: Commission Internationale de l'Enseignement Mathématique
Band: 45 (1999)
Heft: 1-2: L'ENSEIGNEMENT MATHÉMATIQUE

Kapitel: Analyse fonctionnelle et théorie des opérateurs

is presented with detailed analysis and illustrations combined with historical information. The author covers the appearance of the Gibbs phenomenon in Fourier analysis, orthogonal expansions, integral transforms, splines and wavelet approximations. Methods of reducing, or filtering out, such phenomena that cover all the above function representations are also addressed. The book includes a thorough bibliography of some 350 references.

Transformations intégrales, calcul opérationnel

M.W. WONG. — **Weyl transforms.** — Universitext. — Un vol. relié, 16×24, de VIII, 158 p. — ISBN 0-387-98414-3. — Prix: DM 89.00. — Springer, New York, 1998.

The functional analytic properties of Weyl transforms as bounded linear operators on $L^2(\mathbf{R}^n)$ are studied in terms of the symbols of the transforms. The boundedness, the compactness, the spectrum, and the functional calculus of the Weyl transform are proved in detail. New results and techniques on the boundedness and compactness of the Weyl transforms in terms of the symbols in $L^r(\mathbf{R}^{2n})$ and in terms of the Wigner transforms of Hermite functions are given. Background materials are given in adequate detail to enable a graduate student to proceed rapidly from the very basics to the frontier of research in an area of operator theory.

Equations intégrales

Donal O'REGAN and Maria MEEHAN. — **Existence theory for nonlinear integral and integrodifferential equations.** — Mathematics and its applications, vol. 445. — Un vol. relié, 16,5×24,5, de 218 p. — ISBN 0-7923-5089-8. — Prix: Dfl. 190.00. — Kluwer Academic Publishers, Dordrecht, 1998.

This book presents an up-to-date account of many topics of current interest in the theory of nonlinear ordinary differential equations. They include fixed point theory, periodic problems, lower and upper surfaces, positone and semi-positone problems, singular equations, limit circle problems, finite and infinite interval problems, and impulsive differential equations. In addition many important applications are presented to complement the theory.

Analyse fonctionnelle et théorie des opérateurs

Ernst ALBRECHT, Martin MATHIEU, (Editors). — **Banach algebras '97.** — Proceedings of the 13th International Conference on Banach Algebras, held at the Heinrich Fabri Institute of the University of Tübingen in Blaubeuren, July 20 — August 3, 1997. — Un vol. relié, 18×24,5, de IX, 566 p. — ISBN 3-11-015466-8. — Prix: DM 328.00. — Walter de Gruyter, 1998.

This volume contains refereed research articles on Banach algebras and related areas by speakers at the 13th International Conference on Banach algebras 1997. Particular topics include algebraic structure of Banach algebras, dual Banach algebras and invariant subspaces, automatic continuity, local spectral theory, algebras of analytic functions, amenability and Banach homology as well as applications in harmonic analysis. Some papers discuss the interplay with Fredholm theory, differential and pseudo-differential operators, several variable spectral theory or nonassociative normed algebras. This book is of interest to researchers and graduate students in functional analysis, algebra, and topology.

Sergey BAGDASAROV. — **Chebyshev splines and Kolmogorov inequalities.** — Operator theory: advances and applications, vol. 105. — Un vol. relié, 17,5×24, de XIII, 205 p. — ISBN 3-7643-5984-6. — Prix: SFr. 148.00. — Birkhäuser Verlag, Basel, 1998.

This monograph describes advances in the theory of extremal problems in classes of functions defined by a majorizing modulus of continuity ω. In particular, an extensive account

is given of structural, limiting, and extremal properties of perfect ω-splines generalizing standard polynomial perfect splines in the theory of Sobolev classes. In this context special attention is paid to the qualitative description of Chebyshev ω-splines and ω-polynomials associated with the Kolmogorov problem of n-widths and sharp additive inequalities between the norms of intermediate derivatives in functional classes with a bounding modulus of continuity. Since, as a rule, the techniques of the theory of Sobolev classes are inapplicable in such classes, novel geometrical methods are developed based on entirely new ideas.

Béla BOLLOBAS. — **Linear analysis: an introductory course.** — Second edition. — Un vol. broché, 15×23, de XI, 240 p. — ISBN 0-521-65577-3. — Prix: £16.95. — Cambridge University Press, Cambridge, 1999.

Now revised and up-dated, this introduction to functional analysis is intended for advanced undergraduate students. The author's aim is not just to cover the standard material in a standard way, but to present results of applications in contemporary mathematics and to show the relevance of functional analysis to other areas. Unusual topics covered include the geometry of finite-dimensional spaces, invariant subspaces, fixed-point theorems, and the Bishop-Phelps theorem. An outstanding feature is the large number of exercises, some straightforward, some challenging, none uninteresting.

Ronald CROSS. — **Multivalued linear operators.** — Pure and applied mathematics. vol. 213. — Un vol. relié, 16×23,5, de X, 335 p. — ISBN 0-8247-0219-0. — Prix: US$ 150.00. — Marcel Dekker, Inc., New York, 1998.

The book describes set-valued mappings relating one subspace of a normed linear space to another... analyzes perturbation theory and stability...details the boundedness and compactness of linear relations... uses density invariance to characterize linear relations...discusses linear selections and dimensionality, index and coindex... outlines polar relationships and the category theorems of functional analysis... contains never-before-published material in book form on index properties in algebraic theory, closable linear relations, the theory of single-valued linear operators, partially and nowhere continuous linear relations... etc.

A. DIJKSMA, I. GOHBERG, M.A. KAASHOEK, R. MENNICKEN, (Editors). — **Contributions to operator theory in spaces with an indefinite metric: the Heinz Langer anniversary volume.** — Operator theory: advances and applications, vol. 106. — Un vol. relié, 17,5×24, de VI, 417 p. — ISBN 3-7643-6003-8. — Prix: SFr. 168.00. — Birkhäuser Verlag, Basel, 1998.

This volume is dedicated to Heinz Langer on the occasion of his 60th birthday. The book begins with his biography and list of publications. It contains a selection of research papers, most of which are devoted to spectral analysis of operators or operator pencils with applications to ordinary and partial differential equations. Other papers deal with time-varying systems, interpolation and factorization problems, and topics from mathematical physics. About half of the papers contain further developments in the theory of operators in spaces with an indefinite metric and treat new applications. The book is of interest to a wide audience of pure and applied mathematicians.

F.G. FRIEDLANDER. — **Introduction to the theory of distributions.** — With additional material by M. JOSHI.- Second edition. — Un vol. broché, 15×23, de VII, 175 p. — ISBN 0-521-64971-4. — Prix: £15.95 (relié: £42.50). — Cambridge University Press, Cambridge, 1999.

The theory of distributions is an extension of classical analysis which has acquired a particular importance in the field of linear partial differential equations, as well as having many

other applications, for example in harmonic analysis. Underlying it is the theory of topological vector spaces, but it is possible to give a systematic presentation without presupposing a knowledge, or using more than a bare minimum, of this. This book adopts this course and is based on graduate lectures given over a number of years. In this second edition, the notion of the wavefront set of a distribution is introduced in an additional chapter contributed by Mark Joshi. This allows many operations on distributions to be extended and gives a much more precise understanding of the nature of the singularities of a distribution.

I. GOHBERG, R. MENNICKEN, C. TRETTER, (Editors). — **Differential and integral operators.** — International Workshop on Operator Theory and Applications, IWOTA 95, in Regensburg, July 31-August 4, 1995. — Operator theory: advances and applications, vol. 102. — Un vol. relié, 17×24, de XII, 324 p. — ISBN 3-7643-5890-4. — Prix: SFr. 148.00. — Birkhäuser Verlag, Basel, 1998.

The conference covered different aspects of linear and nonlinear spectral problems, starting with problems for abstract operators up to spectral theory of ordinary and partial operators, pseudodifferential operators, and integral operators. The workshop was also focussed on operator theory in spaces with indefinite metric, operator functions, interpolation and extension problems. The applications concerned applications to mathematical physics, hydrodynamics, magnetohydrodynamics, quantum mechanics, astrophysics as well as the theory of networks and systems. Its companion volume (OT 103), entitled *Recent Progress in Operator Theory*, complements the other aspects of operator theory covered in the workshop.

I. GOHBERG, R. MENNICKEN, C. TRETTER, (Editors). — **Recent progress in operator theory.** — International Workshop on Operator Theory and Applications, IWOTA 95, in Regensburg, July 31-August 4, 1995. — Operator theory: advances and applications, 9 vol. 103. — Un vol. relié, 17×24, de X, 283 p. — ISBN 3-7643-5891-2. — Prix: SFr. 148.00. — Birkhäuser Verlag, Basel, 1998.

The papers in the two volumes of the proceedings of IWOTA 95 bring the readers up to date on recent achievements in these areas. This volume contains the contributions to different aspects of operator theory and its applications. Its companion volume (OT 102), entitled *Differential and Integral Operators*, is focussed especially on differential and integral operators. The set will be of practical use to a wide-range readership in pure and applied mathematics, physics and engineering sciences.

Robert E. MEGGINSON. — **An introduction to Banach space theory.** — Graduate texts in mathematics, vol. 183. — Un vol. relié, 16×24, de XIX, 596 p. — ISBN 0-387-98431-3. — Prix: DM 134.00. — Springer, New York, 1998.

The purpose of this book is to provide an introduction to the basic theory of Banach spaces and functional analysis. It prepares students for further study of both the classical works and current research. It is accessible to students who understand the basic properties of L^p spaces but have not had a course in functional analysis. The book is sprinkled liberally with examples, historical notes, and references to original sources. Over 450 exercises provide supplementary examples and counterexamples and give students practice in the use of the results developed in the text.

V.S. SUNDER. — **Functional analysis: spectral theory.** — Birkhäuser Advanced Texts. — Un vol. relié, 17×24, de IX, 241 p. — ISBN 3-7643-5892-0. — Prix: SFr. 68.00. — Birkhäuser Verlag, Basel, 1997.

This book presents the concepts of functional analysis required by students of mathematics and physics. It begins with the basics of normed linear spaces and quickly proceeds to

concentrate on Hilbert spaces, specifically the spectral theorem for bounded as well as unbounded operators in separable Hilbert spaces. While the first two chapters are devoted to basic propositions concerning normed vector spaces and Hilbert spaces, the third chapter treats advanced topics which are perhaps not standard in a first course on functional analysis (a detour into operator algebras). The fourth chapter reverts to more standard operator theory in Hilbert space, dwelling on topics such as the spectral theorem for normal operators, the polar decomposition theorem, and the Fredholm theory for compact operators.

Calcul des variations

Andrea BRAIDES, Anneliese DEFRANCESCHI. — **Homogenization of multiple integrals.** — Oxford lecture series in mathematics and its applications, vol. 12. — Un vol. relié, 16,5×24, de XIV, 298 p. — ISBN 0-19-850246-X. — Prix: £40.00. — Clarendon Press, Oxford, 1998.

Homogenization results and appropriate descriptive formulae are given for periodic and almost periodic functionals. Applications are described to the asymptotic behaviour of oscillating energies describing cellular hyperelastic materials, porous media, materials with stiff and soft inclusions, and fibred media; to homogenization of Hamilton-Jacobi equations and Riemannian metrics, and to materials with multiple scales of microstructure and with multi-dimensional structure. There is a self-contained and up-to-date introduction to the relevant results of the direct methods of Γ-convergence and of the theory of weak lower semi-continuous integral functions that depend on vector-valued functions.

Jürgen JOST, Xianqing LI-JOST. — **Calculus of variations.** — Cambridge studies in advanced mathematics, vol. 64. — Un vol. relié, 16×23,5, de XVI, 323 p. — ISBN 0-521-64203-5. — Prix: £37.50. — Cambridge University Press, Cambridge, 1999.

One-dimensional problems and classical issues like Euler-Lagrange equations are treated, as are Noether's theorem, Hamilton-Jacobi theory, and in particular geodesic lines, thereby developing some important geometric and topological aspects. The basic ideas of optimal control theory are also given. The second part of the book deals with multiple integrals. After a review of Lebesgue integration, Banach and Hilbert space theory and Sobolev spaces (with complete details and proofs), there is a treatment of the direct methods and the fundamental lower semi-continuity theorems. Subsequent chapters introduce the basic concepts of the modern calculus of variations, namely relaxation, Gamma convergence, bifurcation theory and minimax methods based on the Palais-Smale condition.

Géométrie

Jack B. KUIPERS. — **Quaternions and rotation sequences: a primer with applications to orbits, aerospace, and virtual reality.** — Un vol. relié, 20×26, de XXII, 371 p. — ISBN 0-691-05872-5. — Prix: £35.00. — Princeton University Press, Princeton, distributed by John Wiley & Sons, Chichester, 1999.

In this book, the author introduces quaternions for scientists and engineers who have not encountered them before and shows how they can be used in a variety of practical situations. The opening chapters present introductory material and establish the book's terminology and notation. The next part presents the mathematical properties of quaternions, including quaternion algebra and geometry. It includes more advanced special topics in spherical trigonometry, along with an introduction to quaternion calculus and perturbation theory. In the final section, the author discusses state-of-the-art applications.